

The Asterinidæ include *Asterina* (*A. gibbosa* and *A. calcar*) and *Palmipes*. *Palmipes membranaceus* is very distinct; but *P. inflatus* very clearly allies the genus to *Asterina* and even to *Porania* (*P. pulvillus*), which I propose to unite with this family, and which, in the classification of Müller and Troschel, formed, with the *Gymnasteriæ*, the genus *Asteropsis*. The *Gymnasteriæ*, on the contrary, belong, as we have seen, to the family Goniasteridæ, as is shown by the structure of their dentary apparatus and the presence of spicules in their ambulacra.

The Astropectinidæ, reduced to the genera *Astropecten* (*A. aurantiacus*), *Luidia* (*L. clathrata*), and *Ctenodiscus* (*C. corniculatus*), form a very natural family; but we must completely separate from them the genus *Archaster*, or, at any rate, *A. typicus* and *angulatus*, which, for the present, remain perfectly isolated.

I have been unable to study any specimens of the other families, and therefore preserve an absolute silence upon them, except to say that, from an attentive reading of M. Sars's memoir and an examination of his plates, I have arrived at the conviction that, in spite of its two rows of ambulacra and its other peculiarities, the genus *Brisinga* ought to be approximated to the Asteriadæ. Perhaps the odontophore may have undergone some such modification as it presents in *Heliaster*, although the figure does not prove much in this respect, but the teeth are certainly the teeth of Asteriadæ. This would be confirmatory of the opinion which led M. Perrier to believe in the presence in *Brisinga* of crossed pedicellariæ, which he regards as characteristic of the Asteriadæ.—*Comptes Rendus*, March 11, 1878, p. 681.

*On the Aerial Respiration of some Brazilian Fishes.*

By Prof. JOBERT. Report by Prof. MILNE-EDWARDS.

M. Jobert, Professor at the Faculty of Sciences at Dijon, and at present in Brazil, was commissioned by His Majesty Don Pedro to make various zoological investigations in the valley of the Upper Amazon, a region the study of which was commenced some years ago in a brilliant fashion by Agassiz. We have as yet no information with regard to the general results obtained by M. Jobert, who was at Tubatinga, near the frontier of Peru, in the month of September last; but, recently, the Emperor of Brazil has addressed to the Academy, through General Morin, a memoir by this traveller upon a special subject of very considerable interest, namely, the peculiar mode of respiration of several freshwater fishes inhabiting that part of South America.

In a previous memoir M. Jobert had made known the occurrence of an aerial respiration in *Callichthys asper*, a Siluroid fish which inhabits the environs of Rio de Janeiro, and which has the power of living for a long time out of water. Like the common Loach (*Cobitis fossilis*) of Europe, this *Callichthys* frequently swallows bubbles of air, partly absorbs the oxygen from them by the walls of

its digestive tube, and by the same course excretes carbonic acid gas, which is afterwards evacuated by the anus mixed with the unabsorbed nitrogen. There is consequently in these animals, which also respire by means of branchiæ like ordinary fishes, a complementary respiration analogous to the pulmonary respiration of the terrestrial Vertebrata, but having its seat in the intestinal canal; and M. Jobert has ascertained that in the *Callichthys* this tube presents in its anatomical structure peculiarities in connexion with this exceptional function.

In fact, M. Jobert has found, in the sublaminal portion of the intestine of this fish, a multitude of filiform appendages, arranged in tufts on the free surface of the mucous membrane, and composed essentially of blood-vessels. Up to a certain point these tufts are comparable to the respiratory organs discovered by Réaumur in the rectum of certain larvæ of insects, and formed by prolongations of the tracheary system. Just as these internal branchiæ enable the *Libellulæ* to live in the water during the first period of their existence, the sanguiferous appendages of the intestinal coat of *Callichthys* serve to maintain an accessory aerial respiration in those aquatic animals.

In the memoir upon which the Academy has commissioned us to report, M. Jobert makes known the occurrence of a more or less analogous aerial respiration in several other fishes, the habits of which he has had the opportunity of studying in the valley of the Upper Amazon. These animals live in stagnant water, the temperature of which often exceeds 40° C. (104° F.); but this medium does not suffice to support their respiration, and they are obliged to come frequently to the surface to draw in air from the atmosphere. Sometimes, even, the drought drives them from their ordinary abode, and they are seen making journeys by land, of greater or less length, in search of more favourable localities; when thus engaged they crawl along the ground by means of their pectoral fins. Some of these fishes are peculiar species of *Callichthys*, and, like the *C. asper* of Rio de Janeiro, they have the faculty of respiring in two modes—respiring the air dissolved in the circumambient water, and which comes in contact with their branchiæ, and respiring also the atmospheric air which is introduced by deglutition into their digestive tube, traverses that canal throughout its whole length, and, afterwards escaping by the anus, produces a sort of continual bubbling in the water. M. Jobert had not at his command the necessary means for determining with precision the chemical composition of the gas which is thus evacuated; but he was able to ascertain that this fluid contains a large proportion of carbonic acid, and that it is less rich in oxygen than atmospheric air. Lastly, on studying anatomically the vascular tufts which clothe the walls of the intestine in which the air, in passing, loses oxygen and becomes charged with carbonic acid, M. Jobert ascertained that many of these sanguiferous appendages originate from adjacent veins, in the same way as the afferent vessels of a lung.

Other fishes of the Upper Amazon belonging to the genus *Doras*, and living in the same waters, resemble the species of *Callichthys* in their mode of aerial respiration, as well as in the structure of the mucous coat of the intestine in which this function is performed; and M. Jobert has ascertained that nearly the same thing takes place in the fishes known as *Hypostomi*. These animals also incessantly swallow air, and their intestine, into which the air is thus introduced, is almost equally rich in blood-vessels; but the air which has served for the intestinal respiration of the *Hypostomi* is not evacuated by the anus, and returns towards the mouth, to be expelled either by that orifice or by the branchial apertures. The complementary respiratory apparatus thus formed appears to be less perfect than in *Callichthys*: and, moreover, M. Jobert has ascertained that the *Hypostomi* are incapable of living so long out of the water as these latter fishes; they die within from five to seven hours.

M. Jobert has further ascertained the existence of a complementary aerial respiration in *Sudis gigas* and in certain *Erythrini* of the Upper Amazon; but in these fishes it is no longer the intestine that plays the part of lungs, but the so-called swimming-bladder is the seat of this function. Ichthyologists know that in the *Erythrini* this pneumatic sac, which communicates with the outer world by means of the œsophagus, is furnished internally with little alveolar chambers; but the walls of these cells, which had been studied only in animals preserved in spirits, were regarded as simple membranous folds, and in consequence most physiologists denied them the characteristic structure of a lung. M. Jobert has removed all uncertainty upon this point; he has ascertained that in these *Erythrini* there is really an aerial respiration which gives these fishes the power of living for a long time out of water, that these animals regularly renew the air contained in their pneumatic bladder, and that the walls of this organ are richly provided with blood-vessels, most of which originate from the venous system. Lastly, M. Jobert has ascertained experimentally that, by obstructing the canal by which this organ communicates with the atmosphere, the asphyxia and death of the fishes just mentioned are produced.

But all the fishes designated by zoologists by the generic name *Erythrinus* do not enjoy the faculty of living in this way out of the water. M. Jobert has found that the *Erythrinus trachina* of the Amazon is in this case; and this exception seems to corroborate the conclusions of the author as to the functions of the so-called swimming-bladder in the other *Erythrini*; for in the fish just mentioned, M. Jobert has ascertained that the cells and the venous network, so highly developed in *Erythrinus taeniatus* and *E. brasiliensis*, are wanting, and that the walls of the pneumatic sac are smooth.

We see therefore that the journey of M. Jobert in the valley of the Upper Amazon has already furnished physiological zoology with very interesting facts, which establish new bonds between the ordinary fishes, the Lepidosirens, and the perennibranchiate Ba-

trachia, which possess at the same time branchiæ and ordinary lungs. The observations of M. Jobert on the intestinal respiration of *Callichthys* are equally important.—*Comptes Rendus*, April 15, 1878, p. 935.

*Fossil Mammal from the Jurassic of the Rocky Mountains.*

By Prof. O. C. MARSH.

One of the most interesting discoveries made in the Rocky-Mountain region is the right lower jaw of a small mammal recently received at the Yale-College Museum. The specimen was found in the *Atlantosaurus*-beds of the Upper Jurassic, and the associated fossils are mainly Dinosaurs.

*Dryolestes priscus*, gen. et sp. nov.

This specimen is in fair preservation, although most of the teeth have been broken off in removing it from the rock. The penultimate molar, however, remains. The shape of the jaw, and the position and character of the teeth, show that the animal was a small marsupial, allied to the existing Opossums (*Didelphidæ*). The tooth preserved has the same general form as the corresponding molar of *Chironectes variegatus*, Illiger. The angle of the jaw is imperfect, but there are indications that it was inflected.

The principal dimensions of this specimen are as follows:—

	millim.
Space occupied by seven posterior teeth . . . . .	12·5
Depth of jaw below last molar . . . . .	4·4
Transverse diameter . . . . .	1·8
Height of crown of penultimate molar . . . . .	2·0
Transverse diameter . . . . .	1·5

The present specimen indicates an animal about as large as a weasel. It is of special interest, as hitherto no Jurassic mammals have been found in this country.—*American Journ. Sci. & Arts*, June 1878.

Yale College, New Haven, May 13, 1878.

*On a rare Form of the Hepatic Organ in the Vermes.*

By M. J. CHATIN.

In most Vermes, the liver, represented by a cellular layer which lies on the wall of the intestine and covers it for a greater or less extent, seems to differ profoundly from the same organ in the Mollusca, Crustacea, &c.

The examination of certain types shows, however, that this distinction is far from being so absolute as might be imagined at first sight; and in some Annelids belonging to the Hirudinæ (*Pontobdella*)